

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-277636

(43)Date of publication of application : 25.09.2002

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(51)Int.Cl. G02B 5/30  
C08J 5/18  
C08J 7/04  
G02F 1/1335  
// C08L 65:00

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(21)Application number : 2001-077656

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(22)Date of filing : 19.03.2001

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## (54) POLARIZING PLATE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To develop a polarizing plate of which the polarizing layer is hardly cracked even under high temperature and which is practicable even at 120° C and excellent in heat resistance.

**SOLUTION:** The polarization plate is constructed by arranging the polarizing layer composed of a coating film of a lyotropic liquid crystalline dichroic pigment or of a lyotropic substance containing a dichroic dye on a film composed of a norbornene resin and exhibiting ≤0.05% degree of shrinkage on heating at 80° C for three hours.

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## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2002-277636

(P2002-277636A)

(43)公開日 平成14年9月25日(2002.9.25)

(51)Int.Cl.<sup>7</sup>

G 0 2 B 5/30

C 0 8 J 5/18

7/04

識別記号

CE Z

G 0 2 F 1/1335

// C 0 8 L 65:00

5 1 0

F I

G 0 2 B 5/30

C 0 8 J 5/18

7/04

G 0 2 F 1/1335

C 0 8 L 65:00

コード(参考)

2 H 0 4 9

2 H 0 9 1

4 F 0 0 6

4 F 0 7 1

審査請求 未請求 請求項の数 2 OL (全 4 頁)

(21)出願番号

特願2001-77656(P2001-77656)

(22)出願日

平成13年3月19日(2001.3.19)

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(54)【発明の名称】 偏光板

(57)【要約】

【課題】 高温下においても偏光層にひび割れが生じ難く120°Cの温度下にても実用に耐えて耐熱性に優れる偏光板の開発。

【解決手段】 ノルボルネン系樹脂からなり、80°Cで3時間加熱した時の収縮率が0.05%以下であるフィルムに、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質のコーティング膜からなる偏光層を設けてなる偏光板。

## 【特許請求の範囲】

【請求項1】 ノルボルネン系樹脂からなり、80℃で3時間加熱した時の収縮率が0.05%以下であるフィルムに、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質のコーティング膜からなる偏光層を設けてなることを特徴とする偏光板。

【請求項2】 請求項1において、ノルボルネン系樹脂からなるフィルムの光弾性係数が $4.5 \times 10^{-12} m^2 \cdot s^2 / kg$ 以下である偏光板。

## 【発明の詳細な説明】

## 【0001】

【発明の技術分野】 本発明は、耐熱性に優れて液晶表示装置等の形成に好適な偏光板に関する。

## 【0002】

【従来の技術】 従来、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質のコーティング膜をトリアセチルセルロース又はポリエチレンテレフタレートからなるフィルムで支持した偏光板が知られていた(特表平8-511109号公報、WO97/39380号公報)。これはその偏光層が量産性に優れる上に耐熱性にも優れることより、それまでのポリビニルアルコール系フィルム中にヨウ素等を配向させた偏光フィルムなどからなる偏光板では耐久性不足で実用に供し得ない用途などに期待されている。しかしながら120℃程度の温度下で実用に供した場合に偏光層にクラック等のひび割れが生じて実用に耐えない問題点があった。

## 【0003】

【発明の技術的課題】 本発明は、高温下においても偏光層にひび割れが生じ難く120℃の温度下にても実用に耐えて耐熱性に優れる偏光板の開発を課題とする。

## 【0004】

【課題の解決手段】 本発明は、ノルボルネン系樹脂からなり、80℃で3時間加熱した時の収縮率が0.05%以下であるフィルムに、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質のコーティング膜からなる偏光層を設けてなることを特徴とする偏光板を提供するものである。

## 【0005】

【発明の効果】 本発明によれば、高温下においても偏光層にひび割れが生じ難く120℃の温度下にても実用に耐えて耐熱性に優れる偏光板を得ることができる。これは上記した高温下においても収縮しにくいフィルムを用いたことによる。すなわち本発明者らは上記した偏光層のひび割れ問題を克服するために鋭意研究を重ねる中でそのひび割れ問題は偏光層に起因するのではなく、そのコーティング膜を支持するフィルムの収縮に原因することを究明し上記したノルボルネン系樹脂フィルムの使用にてひび割れ問題を克服したものである。

## 【0006】

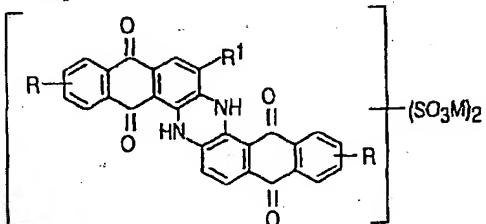
【発明の実施形態】 本発明による偏光板は、ノルボルネン系樹脂からなり、80℃で3時間加熱した時の収縮率が0.05%以下であるフィルムに、リオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質のコーティング膜からなる偏光層を設けたものよりなる。

【0007】 好ましく用いうるノルボルネン系樹脂フィルムは、80℃で3時間加熱した時の収縮率が0.04%以下、就中0.03%以下のものである。また光弾性係数が $4.5 \times 10^{-12} m^2 \cdot s^2 / kg$ 以下、就中 $4.3 \times 10^{-12} m^2 \cdot s^2 / kg$ 以下のノルボルネン系樹脂フィルムであることが好ましい。光弾性係数が大きいと位相差が発生しやすくその位相差で偏光層を介した直線偏光が梢円偏光化して偏光度が低下する。フィルム厚は、支持強度等に応じて適宜に決定しうるが一般には薄型軽量化等を目的に $200 \mu m$ 以下、就中 $1 \sim 150 \mu m$ 、特に $5 \sim 100 \mu m$ とされる。

【0008】 リオトロピック液晶性の二色性色素、二色性染料含有のリオトロピック性物質としては、従来のコーティング方式による偏光層の形成で使用の適宜なものを1種又は2種以上を用いることができ、特に限定はない。ちなみにその二色性染料含有のリオトロピック性物質の具体例としては、WO97/39380号公報によるものなどがあげられ、商品名:L Cポラライザー(Optiva社製)などの市販品もある。

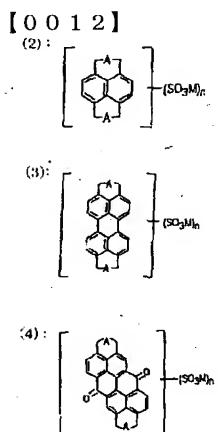
【0009】 一方、リオトロピック液晶性の二色性色素の例としては、式:(クロモゲン) $(SO_3M)_n$ で表される水溶性の有機色素などがあげられ、これはクロモゲンがアゾや多環式化合物等からなって液晶性を付与し、スルホン酸又はその塩が水溶性を付与して全体としてリオトロピック液晶性を示す(特表平8-511109号公報)。ちなみにその具体例としては、下記の式(1)~(7)で表される化合物などがあげられる。

## 【0010】

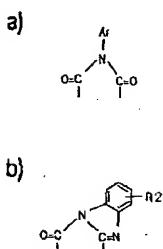


【0011】 前記の式(1)において、R1は水素又は塩素であり、Rは水素、アルキル基、Ar-NH又はAr-CONHである。アルキル基としては炭素数が1~4個のもの、就中メチル基やエチル基が好ましく、アリール基(Ar)としては置換又は無置換のフェニル基、就中4位を塩素で置換したフェニル基が好ましい。またMはカチオンであり、水素イオン、Li<sup>+</sup>やNa<sup>+</sup>、K<sup>+</sup>やCs<sup>+</sup>の如き第一族金属のイオン、アンモニウムイオンなどが好ましい(以下同じ)。

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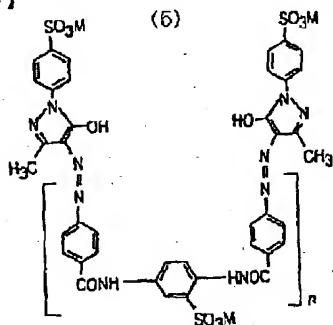


A:



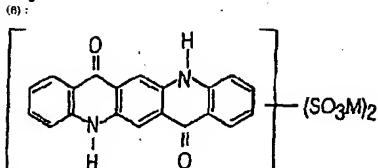
【0013】前記式(2)～(4)において、Aは式(a)又は(b)で表されるものあり、そのR2は水素、アルキル基、ハロゲン又はアルコキシ基、Arは置換又は無置換のアリール基、nは2又は3である。前記のアルキル基は炭素数が1～4個のもの、就中メチル基又はエチル基が好ましく、ハロゲンは臭素又は塩素が好ましい。またアルコキシ基は炭素数が1又は2個のもの、就中メトキシ基が好ましく、アリール基は置換又は無置換のフェニル基、就中、無置換あるいは4位をメトキシ基、エトキシ基、塩素若しくはブチル基で、又は3位をメチル基で置換したフェニル基が好ましい。

## 【0014】



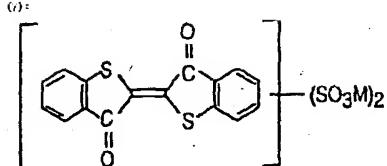
【0015】前記の式(5)において、nは3～5が好ましい。

## 【0016】



## 【0017】

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【0019】偏光板の形成は、例えればリオトロピック液晶性の二色性色素又は二色性染料含有のリオトロピック性物質の1種又は2種以上を溶解させた例えれば固形分濃度が1～30重量%の溶液をドクターブレード方式やワイヤバーコート方式等の剪断力が作用する適宜な塗工方式でノルボルネン系樹脂フィルム上にコーティングする方法などにより行うことができる。その場合、塗工時の剪断力で二色性色素等を配向させることができその配向固化層が二色性の偏光機能を示す。偏光層の厚さは適宜20に決定しうるが一般には薄型化や偏光特性、耐久性等の点より15μm以下、就中0.1～10μm、特に0.2～5μmとされる。

【0020】本発明による偏光板は、液晶表示装置の形成などに好ましく用いられる。その実用に際しては例えれば液晶セル等の他部材との接着を目的に、偏光板の片側又は両側に粘着層を設けた形態や、位相差層等の適宜な光学層の1層又は2層以上と積層した形態などの適宜な構造の光学部材として用いることもできる。位相差層等の光学層との積層は、液晶表示装置の製造過程で順次別個30に積層する方式にても行いられるが、予め積層一体化することより光軸のズレ等による品質のバラツキが生じにくく液晶表示装置の組立効率に優れるなどの利点を有している。

【0021】前記の粘着層には例えればアクリル系やシリコーン系、ポリエステル系やポリウレタン系、ポリエーテル系やゴム系などの適宜なものを用いることができ特に限定はない。粘着層には必要に応じて例えば天然物や合成物の樹脂類、ガラス繊維やガラスピーブ、金属粉やその他の無機粉末等からなる充填剤や顔料、着色剤や酸40化防止剤などの適宜な添加剤を配合することもできる。また微粒子を含有させて光拡散性を示す粘着層とすることもできる。

【0022】なお前記の光学層には位相差層のほか例えれば防眩層や反射防止層、透明保護層や帯電防止層、光拡散層ないし光拡散制御層、輝度向上層や反射層ないし半透過層などの液晶表示装置の形成に用いられる適宜なものを用いることができる。また上記した光学層などの各層は、例えばサリチル酸エステル系化合物やベンゾフェノン系化合物、ベンゾトリアゾール系化合物やシアノアクリレート系化合物、ニッケル錯塩系化合物等の紫外線50

吸収剤で処理する方式などにより紫外線吸収能をもたせることもできる。

【0023】偏光板を用いての液晶表示装置の形成は、従来に準じて行いうる。すなわち液晶表示装置は一般に、液晶セルと偏光板及び必要に応じての光学層や照明システム等の構成部品を適宜に組立てて駆動回路を組込むことなどにより形成されるが、本発明においては本発明による偏光板を用いてそれを液晶セルの少なくとも片側に設ける点を除いて特に限定ではなく従来に準じうる。従って液晶セルの片側又は両側に偏光板を配置した液晶表示装置や、照明システムにバックライトあるいは反射板や半透過型反射板を用いてなる透過型や反射型、あるいは反射・透過両用型などの適宜な液晶表示装置を形成することができる。また液晶セルについても例えばTN型やSTN型、TFT型や強誘電性液晶型などの任意なものを用いうる。

#### 【0024】

##### 【実施例】実施例1

二色性染料含有のリオトロピック液晶水溶液(Optivac社製、LCDポラライザー、固形分濃度16.7重量%)をワイヤーバー(No.5)にて厚さ50μmのノ

ルボルネン系樹脂フィルム(JSR社製、アートン)の上にコーティングした後、40℃で乾燥させて厚さ5μmの偏光層を形成し、偏光板を得た。

##### 【0025】比較例1

ノルボルネン系樹脂フィルムに代えてトリアセチルセルロースフィルム(富士写真フィルム社製、TD-80U)を用いたほかは実施例1に準じて偏光板を得た。

##### 【0026】比較例2

ノルボルネン系樹脂フィルムに代えてポリエチレンテレフタレートフィルム(東レ社製)を用いたほかは実施例1に準じて偏光板を得た。

##### 【0027】評価試験

実施例、比較例で得た偏光板を120℃の雰囲気下に120時間放置したのち取り出して外観観察し耐熱性を調べ、その結果を次表に示した。なお表には支持基材に用いたフィルムのTg(ガラス転移温度)、80℃で3時間加熱した時の収縮率、及び光弾性係数も示した。その収縮率は、100mm角のサンプルについてMD、TDの各方向における収縮率を算術平均したものである。

##### 【0028】

	Tg(℃)	収縮率(%)	光弾性係数	耐熱性
実施例1	169	0.02	4.1	良好
比較例1	69	0.11	5.0	偏光層にひび割れあり
比較例2	92	0.14	5.0	偏光層にひび割れあり

\* : 光弾性係数の単位は、( $\times 10^{-12} \text{ m}^2 \cdot \text{s}^2 / \text{kg}$ )である。

フロントページの続き

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Fターム(参考) 2H049 BA02 BA26 BB48

2H091 FA08X FA08Z LA02 LA04

LA30

4F006 AA11 AA31 AB65 AB66 BA00

CA05 DA04

4F071 AA39 AA69 AC12 AC13 AF29Y

AF61Y BC01

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CLAIMS

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[Claim(s)]

[Claim 1] The polarizing plate which consists of a norbornene system resin, prepares the polarization layer which becomes the film whose contraction when heating at 80 degrees C for 3 hours is 0.05% or less from the dichroism coloring matter of lyotropic-liquid-crystal nature, or the coating film of the RIOTORO pick nature matter of dichromatic-dye content, and is characterized by the bird clapper.

[Claim 2] The polarizing plate whose photoelasticity coefficient of the film which consists of a norbornene system resin in a claim 1 is less than [ 4.5x10-12m<sup>2</sup> and S<sup>2</sup>/kg ].

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Field of the Invention] this invention is excellent in thermal resistance, and relates to the suitable polarizing plate for formation of a liquid crystal display etc.

[0002]

[Description of the Prior Art] Conventionally, the polarizing plate which supported the dichroism coloring matter of lyotropic-liquid-crystal nature or the coating film of the RIOTORO pick nature matter of dichromatic-dye content with the film which consists of a triacetyl cellulose or a polyethylene terephthalate was known (a \*\*\*\*\* No. 511109 [ eight to ] official report, WO 97/No. 39380 official report). From the polarization layer being upwards excellent in mass-production nature, and excelling also in thermal resistance, with the polarizing plate which consists of a polarization film which carried out orientation of the iodine etc. into the polyvinyl alcohol system film till then, as for this, endurance is insufficient and it is expected to the use with which practical use cannot be presented. However, when practical use was presented under the temperature of about 120 degrees C, there was a trouble of the crack of a crack etc. having arisen in a polarization layer and not bearing practical use.

[0003]

[The technical problem of invention] this invention makes a technical problem development of the polarizing plate which is equal to practical use also under the temperature which is 120 degrees C that it is hard to produce a crack in a polarization layer under an elevated temperature, and is excellent in thermal resistance.

[0004]

[Means for Solving the Problem] this invention consists of a norbornene system resin, and the polarizing plate with which the contraction when heating at 80 degrees C for 3 hours prepares the polarization layer which becomes the film which is 0.05% or less from the dichroism coloring matter of lyotropic-liquid-crystal nature or the coating film of the RIOTORO pick nature matter of dichromatic-dye content, and is characterized by the bird clapper is offered.

[0005]

[Effect of the Invention] According to this invention, the polarizing plate which is equal to practical use also under the temperature which is 120 degrees C that it is hard to produce a crack in a polarization layer under an elevated temperature, and is excellent in thermal resistance can be obtained. This is because the film which is hard to contract under the above-mentioned elevated temperature was used. That is, in order that this invention persons may conquer the crack problem of the above-mentioned polarization layer, while repeating research wholeheartedly, the crack problem does not originate in a polarization layer, but a crazing problem is conquered by use of the norbornene system resin film which studied and described above resulting from contraction of the film which supports the coating film.

[0006]

[The operation form of invention] The polarizing plate by this invention consists of a norbornene system resin, and consists of what prepared the polarization layer which becomes the film whose contraction when heating at 80 degrees C for 3 hours is 0.05% or less from the dichroism coloring matter of lyotropic-liquid-crystal nature, or the coating film of the RIOTORO pick nature matter of dichromatic-dye content.

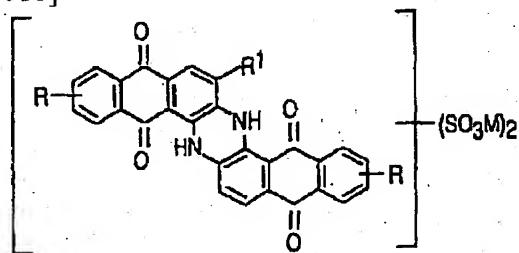
[0007] The contraction when heating the norbornene system resin film which can be used preferably at 80 degrees C for 3 hours is 0.03% or less of thing above all 0.04% or less. Moreover, it has a desirable photoelasticity coefficient less than [ 4.5x10-12m<sup>2</sup> and S<sup>2</sup>/kg ] and that it is a norbornene system resin film not more than 4.3x10-12m<sup>2</sup> and S<sup>2</sup>/kg above all. If a photoelasticity coefficient is large, the linearly polarized light which minded the polarization layer with the phase contrast that it is easy to generate phase contrast will elliptically-polarized-light-ize, and degree of polarization will fall. Although film \*\* can be suitably determined according to support intensity etc., especially generally it is set to 5-100 micrometers 1-150 micrometers above all 200 micrometers or less for the purpose of the

formation of thin shape lightweight etc.

[0008] As the dichroism coloring matter of lyotropic-liquid-crystal nature, and RIOTORO pick nature matter of dichromatic-dye content, one sort or two sorts or more can be used for the proper thing of use by formation of the polarization layer by the conventional coating method, and there is especially no limitation. Incidentally, as an example of the RIOTORO pick nature matter of the dichromatic-dye content, what is depended on WO 97/No. 39380 official report is raised, and there is commercial elegance, such as a tradename:LC polarizer (product made from Optiva).

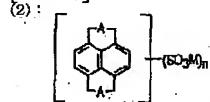
[0009] On the other hand as an example of the dichroism coloring matter of lyotropic-liquid-crystal nature, the water-soluble organic coloring matter expressed with formula:(chromogen)  $(SO_3M)_n$  is raised, a chromogen consists of azo, a polycyclic compound, etc., mesomorphism is given, a sulfonic acid or its salt gives water solubility, and this shows lyotropic-liquid-crystal nature as a whole (\*\*\*\*\* No. 511109 [ eight to ] official report). The compound incidentally expressed with following formula (1) - (7) as the example is raised.

[0010]

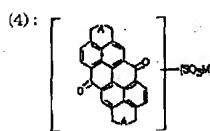
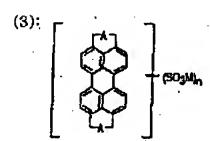
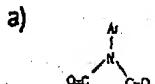


[0011] In the aforementioned formula (1), R1 is hydrogen or chlorine and R is hydrogen, an alkyl group, ArNH, or ArCONH. as an alkyl group -- a carbon number -- 1-4 things -- a methyl group and an ethyl group are desirable above all, and the phenyl group which is not replaced [ substitution or ] and the phenyl group which replaced the 4th place by chlorine above all are desirable as an aryl group (Ar) Moreover, M is a cation and the ion of the first group metal like a hydrogen ion, Li and Na, K, or Cs, an ammonium ion, etc. are desirable (it is below the same).

[0012]

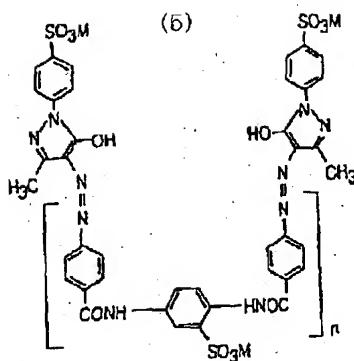


A:



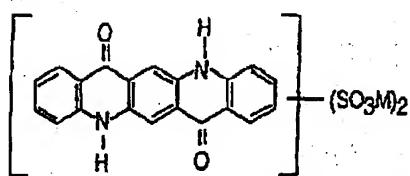
[0013] The aforementioned formula (2) In - (4), those with a thing to which A is expressed with a formula (a) or (b), and its R2 are [ the aryl group which is not replaced / substitution or / and n of hydrogen, an alkyl group a halogen or an alkoxy group, and Ar ] 2 or 3. the aforementioned alkyl group -- a carbon number -- 1-4 things -- a methyl group or an ethyl group is desirable above all, and a bromine or chlorine of a halogen is desirable moreover, an alkoxy group -- a carbon number -- 1 or two things -- a methoxy machine is desirable above all and the phenyl group which is not replaced [ substitution or ] and the phenyl group of an aryl group which is a methoxy machine, an ethoxy basis, chlorine, or a butyl about no replacing or the 4th place, or replaced the 3rd place by the methyl group above all are desirable

[0014]

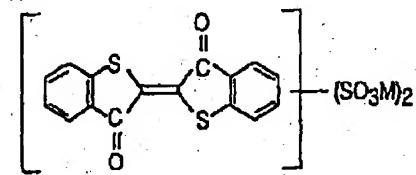


[0015] As for n, in the aforementioned formula (5), 3-5 are desirable.

[0016]



[0017]



[0018] The above-mentioned formula: (chromogen) (SO<sub>3</sub>M) The organic coloring matter expressed with n shows a liquid crystal phase stable at the chromogen, and dissolves it in the water-soluble organic solvent like water, an acetone, alcohol, and a dioxane.

[0019] Formation of a polarizing plate can be performed by the method of coating the solution in which one sort of the dichroism coloring matter of for example, lyotropic-liquid-crystal nature or the RIOTORO pick nature matter of dichromatic-dye content or two sorts or more were dissolved and whose solid-content concentration is 1 - 30 % of the weight, for example with the proper coating method on which shearing force, such as a doctor blade method and a wire bar coat method, acts on a norbornene system resin film etc. In this case, orientation of the dichroism coloring matter etc. can be carried out with the shearing force at the time of coating, and the orientation solidification layer shows the polarization function of dichroism. Although polarization layer thickness can be determined suitably, especially generally it is set to 0.2-5 micrometers 0.1-10 micrometers above all 15 micrometers or less from points, such as thin-shape-izing, and a polarization property, endurance.

[0020] The polarizing plate by this invention can be preferably used for formation of a liquid crystal display etc. It can also use as an optical member of proper structures, such as a gestalt which prepared the adhesive layer in one side or the both sides of a polarizing plate on the occasion of the practical use for the purpose of adhesion with other members, such as a liquid crystal cell, and a gestalt which carried out the laminating to more than two-layer [ of an optical layer with a proper phase contrast layer etc. / one layer or two-layer ]. Although the method which carries out a laminating separately one by one in the manufacture process of a liquid crystal display can also perform the laminating with optical layers, such as a phase contrast layer, it has an advantage, such as excelling in the assembly efficiency of a liquid crystal display that it is hard to produce the variation in the quality by gap of an optical axis etc. from carrying out laminating unification beforehand.

[0021] Proper things, such as acrylic, a silicone system, a polyester system and a polyurethane system, a polyether system, and a rubber system, can be used for the aforementioned adhesive layer, and there is especially no limitation. Proper additives, such as a bulking agent which consists of the resins of a natural product or a compost, a glass fiber, a glass bead and a metal powder, other inorganic powder, etc. if needed, a pigment and a coloring agent, and an antioxidant, can also be blended with an adhesive layer. Moreover, it can also consider as the adhesive layer which is made to contain a particle and shows optical diffusibility.

[0022] In addition, the proper thing used for formation of liquid crystal displays, such as an acid-resisting layer, others,

for example, an anti-glare layer, transparent protection layer and an antistatic layer, an optical diffusion layer or an optical diffusion control layer, an improvement layer in brightness, and a reflecting layer or a transreflective layer, can be used for the aforementioned optical layer. [ layer / phase contrast ] Moreover, each class, such as the above-mentioned optical layer, can also give ultraviolet-absorption ability with the method processed with ultraviolet ray absorbents, such as for example, a salicylate system compound, a benzophenone system compound, a benzotriazol system compound, and a cyanoacrylate system compound, a nickel complex salt system compound.

[0023] Formation of the liquid crystal display using a polarizing plate can be performed according to the former. That is, although a liquid crystal display is formed by assembling suitably component parts, such as an optical layer a liquid crystal cell, a polarizing plate, and as occasion demands and a lighting system, generally, and incorporating a drive circuit etc., in this invention, using the polarizing plate by this invention, there is especially no limitation and it may apply it to the former correspondingly except for the point of a liquid crystal cell prepared in one side at least.

Therefore, a liquid crystal display with the liquid crystal display which has arranged the polarizing plate on one side or the both sides of a liquid crystal cell, the penetrated type which comes to use a back light or a reflecting plate, and a transreflective type reflecting plate for a lighting system, proper reflected type or type both for reflection / transparency, etc. can be formed. Moreover, what has TN type, a STN type, a TFT type, a ferroelectric liquid crystal type arbitrary also about a liquid crystal cell, etc. can be used.

[0024]

[Example] After coating the lyotropic-liquid-crystal solution (the product made from Optiva, LC polarizer, 16.7 % of the weight of solid-content concentration) of example 1 dichromatic-dye content with a wire bar (No.5) on a norbornene system resin film (the product made from JSR, ATON) with a thickness of 50 micrometers, it was made to dry at 40 degrees C, the polarization layer with a thickness of 5 micrometers was formed, and the polarizing plate was obtained.

[0025] Replaced with the example of comparison 1 norbornene system resin film, and the triacetyl-cellulose film (the Fuji Photo Film Co., Ltd. make, TD-80U) was used, and also the polarizing plate was obtained according to the example 1.

[0026] Replaced with the example of comparison 2 norbornene system resin film, and the polyethylene-terephthalate film (Toray Industries, Inc. make) was used, and also the polarizing plate was obtained according to the example 1.

[0027] After leaving the polarizing plate obtained in the evaluation examination example and the example of comparison under 120-degree C atmosphere for 120 hours, appearance observation was taken out and carried out, thermal resistance was investigated, and the result was shown in the following \*\*. In addition, the contraction and photoelasticity coefficient when heating for 3 hours at Tg (glass transition temperature) of the film used for the support base material and 80 degrees C were also shown in the table. The contraction carries out the arithmetic mean of the contraction in each direction of MD and TD about the sample of 100mm angle.

[0028]

Tg (degree C) Contraction (%) Photoelasticity coefficient \*\* Heat A sex Example 1 169 0.02 4.1 Good \*\* Example 1 of comparison 69 0.11 5.0 Crocodile and it is in a polarization layer. Example 2 of comparison 92 0.14 50 Crocodile and it is in a polarization layer. \*: The unit of a photoelasticity coefficient is ( $\times 10^{-12} \text{m}^2$  and  $\text{S}^2/\text{kg}$ ).

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[Translation done.]